REMARKS

The specification page 5, line 9 has been amended to refer to the plug 12. The specification also has been amended to consistently refer to printed circuit board as correctly already referred to in several place in the original specification, for example, page 1, 3rd paragraph line 2, page 5, last line in 2nd paragraph, and in original claims 5 and 15.

In the Office Action, claims 17-18 were rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 17-18 were not understood for no semiconductor chip shown as required under 37 CFR 1.83(a).

To meet this rejection claims 17-18 have been cancelled without prejudice. Claims 11, 16-20 were rejected under 35 USC 102(b) as anticipated by Goodrich on the grounds set forth in the Office Action. Claims 11, 16-20 were rejected under 35 USC 102(b) as anticipated by German '942 for the reasons stated in the Office Action. Claims 11-20 were rejected under 35 USC 103(a) as unpatentable over German '459 in view of Goodrich on the grounds set forth in the Office Action. Claims 11-20 were rejected under 35 USC 103(a) as unpatentable over Hochstein in view of Goodrich for the reasons stated in the Office Action. Claims 11-14, 16-20 were rejected under 35 USC 103(a) as unpatentable over Masami et al in view of Goodrich on the grounds set forth in the Office Action.

Claims 17 and 18 have been cancelled without prejudice and new claim 21 presented comprising the features of claims 11 and 12 and additionally setting forth that the flexible printed circuit board (4) projects at one side. This feature is disclosed in the specification on page 5, lines 7-11. By this feature it is possible to attach a plug to the free flexible end of the flexible printed circuit board (4). This ability is disclosed also on page 5, lines 7-11.

A new claim 22 dependent in claim 21 is presented comprising a plug 12 at its free flexible end. With the plug 12 on the flexible projecting free end of the flexible printed circuit board (4) it is possible to produce a connection to a socket on a rigid printed circuit board reducing the duplication of junction points required on both the mount and on the printed circuit board of the prior art disclosed on page 1 of the present specification.

A Request for Drawing Correction Approval is presented to correct Figs. 1 and 2 to show in red ink the plug 12 at the end 6 of the printed circuit board 4, subject to approval by the Examiner. No new matter is added.

New claims 21 and 22 are neither described nor suggested by the cited art.

Masami et al show in Figs. 5A-E connecting the wiring board via separate wires, the wires having no reference number in the Figures.

In Goodrich the flexible substrate 4 is totally surrounded by the outer envelope 1 as can be seen by Fig. 1.

Hochstein in Figs. 1 and 2 shows feeding the circuit board 26 with electrical power via separate leads 22.

The reference German '942 shows no printed circuit board, only leads on which the LED's 8 are bonded and then encapsulated.

German '459 shows a non-flexible board.

Thus, none of the cited prior art shows or suggests a device according to new claims 21 and 22.

Furthermore, the subject matter of claims 12 and 13 have been inserted into claim 11, and claims 12 and 13 have been cancelled without prejudice.

Goodrich shows a flexible material 5 being polyvinyl chloride (PVC). This material is not a thermally conductive material as in amended claim 11. In the specification of the present invention it is stated that the thermally conductive material is for example copper. The thermal conduction of PVC on the other hand is very poor and is not considered in the art as thermally conductive material.

Since Goodrich describes a flexible material for mounting, from this the person or ordinary skill in the art would not use any thermally conductive material and so new claim 11 should also be allowable.

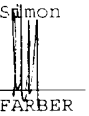
Therefore claims 14, 15, 16, 19 and 29 also should be allowable.

In the event there are further issues remaining in any respect the Examiner is respectfully requested to telephone attorney to reach agreement to expedite issuance of this application.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned "Version with markings to show changes made".

Since the present claims set forth the present invention patentably and distinctly, and are not taught by the cited art either taken alone or in combination, this amendment is believed to place this case in condition for allowance and the Examiner is respectfully requested to reconsider the matter, enter this amendment, and to allow all of the claims in this case.

Respectfully submitted,
Ernst-Ulrich Salmon

by: 
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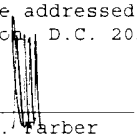
CERTIFICATE OF MAILING UNDER 37 CFR SECTION 1.8(a)

I hereby certify that the accompanying Amendment and Request for Drawing Correction are being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on February 11, 2003.

Dated: February 11, 2003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USA Patent Application
Ernst-Ulrich SIMON
Serial No.: 10/029,403
Filed December 20, 2001
LIGHT SOURCE COMPRISING A LARGE
NUMBER OF LIGHT-EMITTING DIODES
Examiner: Gregory D Thompson
Group art unit: 2835

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Page 1, please replace the paragraph beginning at line 19 with the following rewritten paragraph:

A mount populated in such a way is placed, for example, on a solid printed circuit board, which is provided with equivalent contact points. In order to produce the electrical connection, connection elements must be used between the contact pads on the mount and the contact surfaces on the printed circuit board, making electrically conductive contact with the contact pads. Each connection thus has two junction points, namely one on the mount and the other on the printed circuit board. Furthermore, the light-emitting diodes must be connected to the contact pads on the mount. The wiring is thus very complex.

Page 2, please replace the 8 consecutive paragraphs beginning at line 1 with the following 8 consecutive rewritten paragraphs:

The invention therefore proposes that the light-emitting diodes be mounted alongside one another on one face of a flexible

printed circuit board, and the electrically conductively connected conductor tracks on the flexible printed circuit board.

This arrangement has the advantage that the light-emitting diodes can be connected directly to the current-carrying lines on the flexible printed circuit board. This therefore reduces the number of connections to be produced.

In order to make the arrangement mechanically robust, it is particularly advantageous to mount the flexible printed circuit board on a robust mount, which is at the same time used to dissipate the heat produced by the light-emitting diodes. To this end, this mount is preferably composed of a thermally conductive material, for example copper, and is possibly connected to a heat sink, or is in the form of such a heat sink.

The flexible printed circuit board on which the light-emitting diodes are mounted is connected to the mount in a simple manner by means of thermally conductive adhesive.

The electrical connection between the light-emitting diodes and the current-carrying lines on the flexible printed circuit board is produced via contact pads, with electrical contacts being made between the LEDs and the flexible printed circuit board.

The light-emitting diodes can be integrated individually or as a group of a number of them in the semiconductor chip, in which case sections of the chip can be doped appropriately (also differently). Further[-]more, the semiconductor chip may have a corresponding number of contact pads, via which the light-

emitting diode section or sections is or are supplied with power. When using such semiconductors, only the contact pads on the chip need to be electrically conductively connected to the corresponding contact pads on the flexible printed circuit board.

This connection can be produced by soldering, bonding or adhesive bonding. The term bonding refers to a specific welding process, which is known per se, and which has been proven for populating printed circuits boards with electronic components and which is carried out here specifically on the pads on the flexible printed circuit board.

In order to make the arrangement robust, the invention also proposes that the light-emitting diodes be arranged in an encapsulation compound, which preferably extends to such an extent that only the light outlet surfaces remain free. This results in a mechanical, extremely robust arrangement. Power is supplied to the light-emitting diodes via the conductor track on the flexible printed circuit board, which projects out of the encapsulation compound at the side and can be connected to a rigid printed circuit board via known connector systems.

Page 3, please replace the 7 consecutive 7 paragraphs beginning at line 35 with the following 7 consecutive rewritten paragraphs:

There are boreholes 3 in the corners of the mounting board 2, using which the mounting board 2 can be mounted at a suitable position. A flexible printed circuit board 4 is adhesively bonded to one side face, and has a square accommodation area 5 and a supply line area 6 in the form of a strip. Up to 100 light-

emitting diodes 7 are adhesively bonded onto the accommodation area 5, and are represented here only as small square surfaces. These are connected to the conductor tracks 9 via lines 8, of which only a few are illustrated. The connection is made via small contact pads 10, one of which is illustrated schematically. The conductor track 9 and contact pads 10 are part of the flexible printed circuit board 4. The illustration of the contact pad 10 and of the line 8, which is a thin wire composed of aluminum or gold, is highly magnified.

The accommodation area 5 has a number of contact pads 10 corresponding to the number of light-emitting diodes. These contact pads 10 are arranged such that electrical contact can be made in a simple manner. In order to supply power to the light-emitting diodes 7, the lines 8 are connected firstly to contact pads - which are not shown in any more detail here because they are so small - on the light-emitting diodes, and to the contact pads 10 on the flexible printed circuit board 4.

The bonding process has been particularly proven for connection, in which the lines 8 are welded to the contact pads 10 on the flexible printed circuit board 4. This process can be used particularly well when it is necessary to produce a large number of electrically conductive contacts in a very confined space.

The flexible printed circuit board 4 which has been populated in this way is adhesively bonded onto the mounting board 2 using a thermally conductive paste. The area of the light-emitting diodes 7 is then surrounded by an encapsulation compound 11, which provides further robustness for the arrangement. As is

illustrated schematically in figure 2, the encapsulation compound 11 extends over the edge of the flexible printed circuit board 4 and as far as the upper edge of the light-emitting diodes 7, so that only the light outlet surfaces of the light-emitting diodes 7 remain free. The encapsulation compound 11 makes the arrangement robust, and protects against damage.

As both figures show, the supply line area 6 on the flexible printed circuit board 4 projects at the sides. A plug 12 (Fig. 2) can be attached to its free end, so that it is possible to produce a connection to a socket on a rigid printed circuit board.

The arrangement has the advantage that a large number of light-emitting diodes 7 can be supplied with power via a common line - this being the supply line area 6 on the flexible printed circuit board 4. The process of making contact with the light-emitting diodes 7 is considerably simplified, since the lines 8 of the light-emitting diodes 7 just need to be linked to contact pads 10 on the flexible printed circuit board 4. The thermally conductive mounting board 2 also results in the entire light source having a good thermal budget.

IN THE CLAIMS

Please amend claims 11, 14-16 as follows:

11. (amended) A light source comprising a large number of light-emitting diodes, wherein the light-

emitting diodes (7) are mounted alongside one another on one face of a flexible printed circuit board (4), and are electrically conductively connected to conductor tracks (9) on the flexible printed circuit board (4), wherein the flexible printed circuit board (4) is mounted with that face which is opposite the light-emitting diodes (7) on a stable mounting board (2) for heat dissipation and wherein the mounting board (2) is composed of thermally conductive material.

14. (amended) The light source as claimed in claim [13] 11, wherein the mounting board (2) is connected to a heat sink or is in form of a heat sink.

15. (amended) The light source as claimed in claim [12] 11, wherein the flexible printed circuit board (4) is connected to the mounting board (2) by a thermally conductive adhesive or a thermally conductive adhesion layer.

16. (amended) The light source as claimed in claim 11, wherein the conductor tracks (9) end in contact pads (10) on the flexible printed circuit board (4), [with] and lines (8) which originate from the light-emitting diodes (7) make [making] electrically conductive contact with the contact pads (10) on the flexible printed circuit board (4).